Effect of Examination Stress on Serum Lipid Levels in Healthy Medical Students

Medical Science

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ABSTRACT   *Serum cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol were estimated in 30 medical students exposed to examination stress. All the parameters were estimated using commercial kits adopted to auto analyser. Data was statistically analysed using the paired t test. Serum triglycerides exhibited a significant increase during examination stress. HDL to total cholesterol ratio was significantly decreased during stress. There is no significant change in serum cholesterol levels. Serum cholesterol levels have been variable in different studies. The rise in triglycerides seem to be due to stress induced changes in hormonal levels causing peripheral lipolysis. Further work is needed to correlate the short term effect of stress on lipid profile and the beginning of development of atherogenic changes.*

INTRODUCTION

Man is exposed to various kinds of stressors in day to day life. The stress response can be an asset for rising level of performance. But, if stress becomes persistent it may produce physical or psychological damage over time. Stress has been labeled with many behavioural factors as anxiety, hostility, depression, emotional distress and tension (1). It may result from stressful events in themselves or person's perception of them (2).

Epidemological investigations have implicated certain biochemical, physiological, and environmental factors in the pathogenesis of ischemic heart disease. The biochemical features reflecting the stress levels in serum cholesterol is recognized as a major risk factor in coronary artery disease. Increase in serum cholesterol have been observed in tax accountants under seasonal occupational pressures. Subjects with CHD have been reported to exhibit significant elevations in baseline serum cholesterol concentration prior to and during stressful situations (3).

Studies have shown changes in levels of lipids in response to various types of stress. Mental stress does affect the lipid levels. Chronic exposure to stress may imply sustained lipid elevations (3, 4). Examination stress is a well documented stress (1). The aim of this study was, therefore, to study the effect of examination stress on lipid profile in healthy medical students.

MATERIAL AND METHODS

Thirty healthy medical students including 17 males and 13 females aged between19-22 were selected by random sampling from 120 students for the study. Exclusion criteria was hypertension, smoking, addiction to drugs and tobacco chewing. Written informed consent was obtained from the participants.

Fasting blood samples were drawn in the morning from antecubital vein and serum was separated. All biochemical parameters were estimated by enzymatic method (cholesterol esterase / oxidase / peroxidase method). Normal values of serum cholesterol are 130-200mg/dl. (5) Serum triglycerides were determined using the GPO / PAP method (glycerol phosphate / oxidase / peroxidase method). Normal values are 30-170mg/dl/ (6) HDL cholesterol was determined using the phosphotungstate method. Normal values are 35-70mg/dl. LDL cholesterol was calculated was using Friedwald's equation (7). LDL cholesterol = Total Cholesterol – HDL cholesterol – Triglycerides / 5. Normal LDL cho-

lesterol levels are 130mg/dl.

The first sample was collected 2 months before the examination when the students were not under academic stress and it served as control. The second sample was drawn one day prior to commencement of professional examination. The mean of difference of values obtained at both occasions were calculated and statistically analysed using paired 't' test.

RESULTS AND DISCUSSION

In The present study, serum cholesterol, triglycerides and serum lipids of 17 males and 13 females students were estimated on two occasions, during examination and two months before the exams. Statistical paired 't' test was used to find out the effects of stress of lipid profile and changes in parameters were analyzed. There was highly significant increase in levels of triglycerides by 7.05mg/dl than the non stress levels. HDL cholesterol levels showed a significant decrease in response to stress (p<0.01) (TABL-1). The ratio of HDL / total cholesterol was significantly decreased. The serum levels of total cholesterol were higher by 3.17mg/dl during stress as compared to non stress period though not statistically significant. LDL cholesterol levels were increased by 3.6mg/dl though not significant (TABLE-2).

With the increased incidence of coronary heart disease there has been a concern about the cause effect relationship between stress, cholesterol-lipid lipoprotein metabolism and atherosclerosis (8). Various studies have been conducted to examine lipids and lipoproteins under different stressors. In a study conducted to examine lipids and lipoproteins under different stressors. In a study conducted on twelve medical students Agrawal et al found a significant increase in triglyceride and cholesterol levels due to examination stress (1). Wertake et al have shown as significant rise in cholesterol from a control period to a stress period in 44 medical students undergoing examination (9). Ghulam et al did not find significant change in cholesterol levels during examination stress though there was a significant increase in triglyceride levels and decrease in HDL cholesterol levels. Thus the effects of stress on serum cholesterol seem to be variable. In the present study there was a clear and significant rise in the present study there was a clear and significant rise in the levels of serum triglycerides from control to preexamination period. Mental stress influences lipid and lipoprotein concentrations (11, 12). These lipid and lipoprotein changes have been attributed to the effect of

epinephrine on lipoprotein lipase, hepatic lipase, and hormone sensitive lipase activities. Lipolysis is stimulated by mental stress through beta adrenoreceptors (13). This could explain the rise in serum triglyceride levels during examination stress.

Cortisol is the hormone associated with temporary stressful situations. Situations, often of a challenging or unpleasant nature evokes an increase in serum Cortisol and also an increase in serum cholesterol. An excess of Cortisol in the blood stream has been associated with a rise in serum lipids and cholesterol (4). Increase in serum cholesterol during time of stress could act as a potential source of adrenal steroids required to cope with stressful stimuli. Studies of Wertake et al and Agrawal et al have shown that serum cholesterol levels returned to normal after examination. Some investigators have shown that exposure to short term mental elicits hemoconcentration which is associated with increase in serum lipid concentration (11).

In addition to the concentration of cholesterol the manner in which it is distributed or transported in the blood is associated with risk of development of coronary heart disease. The prevalence of CHD appears to increase with increasing levels of LDL cholesterol and decreases with increasing levels were increased in response to examination stress. HDL levels were significantly decreased and also the HDL / total cholesterol was significantly decreased. HDL cholesterol retards the progression of atherosclerosis by transporting cholesterol out of the arterial wall. Body Cholesterol pool size was negatively correlated with HDL cholesterol concentration (8, 10). Low HDL cholesterol is a common antecedent to clinical CHD.

Mirka et al have postulated that Neurogulin-1 genotype moderates the association between job strain and atherosclerosis in young men (14). Therefore, the mechanisms and consequences of stress induced alterations for lipids and other biological risk factors may differ from population to population. There may be several potential mechanisms through which stress may affect cardiac health and produce clinically significance changes relatively late in life. It was not possible to make any dietary assessments in the present study. Much remains to be learned of the environmental, genetic and behavioral factors which influence blood lipid concentration.

CONCLUSION

In our study lipid profile of thirty medical students was done during examination and stress free period. It was revealed that changes in levels of blood lipids occurred in response to examination stress. Whether these changes are clinically significant is yet to be known. Further work is needed to study the consequences of such short term variation in response to stress. Follow work is needed to study the consequences of such short term variation in response to stress. Follow up study for a long period may be conducted to see for early onset of atherogenic changes related to blood lipid levels during stressful life events occurring from time to time. The inability to adapt to stress may be associated with the onset of depression and anxiety. These psychological stress variables probably influence the levels of standard risk factors for CHD. Hence psychological factors along with socioeconomic problems, especially of students coming from rural interiors, needed to be studied.

TABLE 1: Mean values and SD of parameters of lipids profile in subjects during stress and before stress.

VARIABLES	BEFORE STRESS MEAN± SD	DURING STRESS MEAN± SD	P VALUE
Total cholesterol mg/dl	137.68±17.37	140.85 ±16.35	NS
Triglycerides mg/dl	55.25±12.49	62.3±13.46	P<0.001
HDL-C mg/dl	47.92± 8.19	44.55±7.52	P<0.001
LDL-C mg/dl	79.16±16.03	82.76±13.38	NS
HDL-C/TC	0.35±0.06	0.32±0.06	P<0.006

TABLE 2: Percentage increments in levels of lipid profile parameters during examination stress

VARIABLES	BEFORE STRESS MEAN± SD	DURING STRESS MEAN± SD	MEAN DIFFERENCE	% CHANGE DURING STRESS
Total cholesterol mg/dl	137.68±17.37	140.85±16.35	3.17	2.30% Increase
Triglycerides mg/dl	55.25±12.49	62.3±13.46	7.05	12.76% Increase *
HDL-C mg/dl	47.92± 8.19	44.55±7.52	-3.38	7.05% Decrease*
LDL-C mg/dl	79.16±16.03	82.76±13.38	3.60	4.54% Increase

* $P < 0.001$

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